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April 3, 1997

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APR 3 1997

Federal Communications Commission  
Office of Secretary

Mr. William F. Caton  
Acting Secretary  
Federal Communications Commission  
1919 M Street, N.W., Room 222  
Washington, DC 20554

Re: IB Docket No. 96-220  
Notice of Ex Parte Presentation

Dear Mr. Caton:

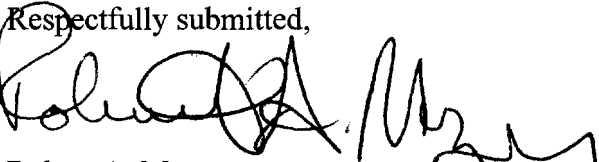
Leo One USA Corporation ("Leo One USA"), by its attorneys, hereby notifies the Commission, pursuant to Section 1.1206 of the Commission's rules, that it participated in a meeting with Commission staff and representatives of GE Starsys Global Positioning, Inc. on April 2, 1997 concerning the above-referenced proceeding. The following members of the International Bureau staff participated:

Daniel Connors  
Paula H. Ford  
Julie Garcia  
Harold Ng  
Cassandra Thomas

The purpose of the meeting was to discuss the Little LEO spectrum use. A copy of the material distributed by Leo One USA during that meeting is attached. An original and one copy of this notice are being submitted to the Secretary's Office. Copies of this letter are being provided to the members of the staff named above.

Any questions regarding this matter should be directed to the undersigned.

Respectfully submitted,



Robert A. Mazer  
Counsel for Leo One USA Corporation

Attachment

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# **Starsys Interference Analysis**

4/2/97

# **Topics**

- **Objectives**

- ▲ Understand Starsys Interference Issues
  - Existing Margin
  - Allowable/Acceptable Interference Criteria For Starsys
- ▲ Does Plan X/Y and/or Plan A/B Result in Acceptable Interference to Starsys

- **LEO One Interference Analysis**

- ▲ Approach
- ▲ Assumptions
- ▲ Results
  - Plan X/Y
  - Plan A/B
- ▲ Possible Interference Reduction Trades/Alternatives Discussion

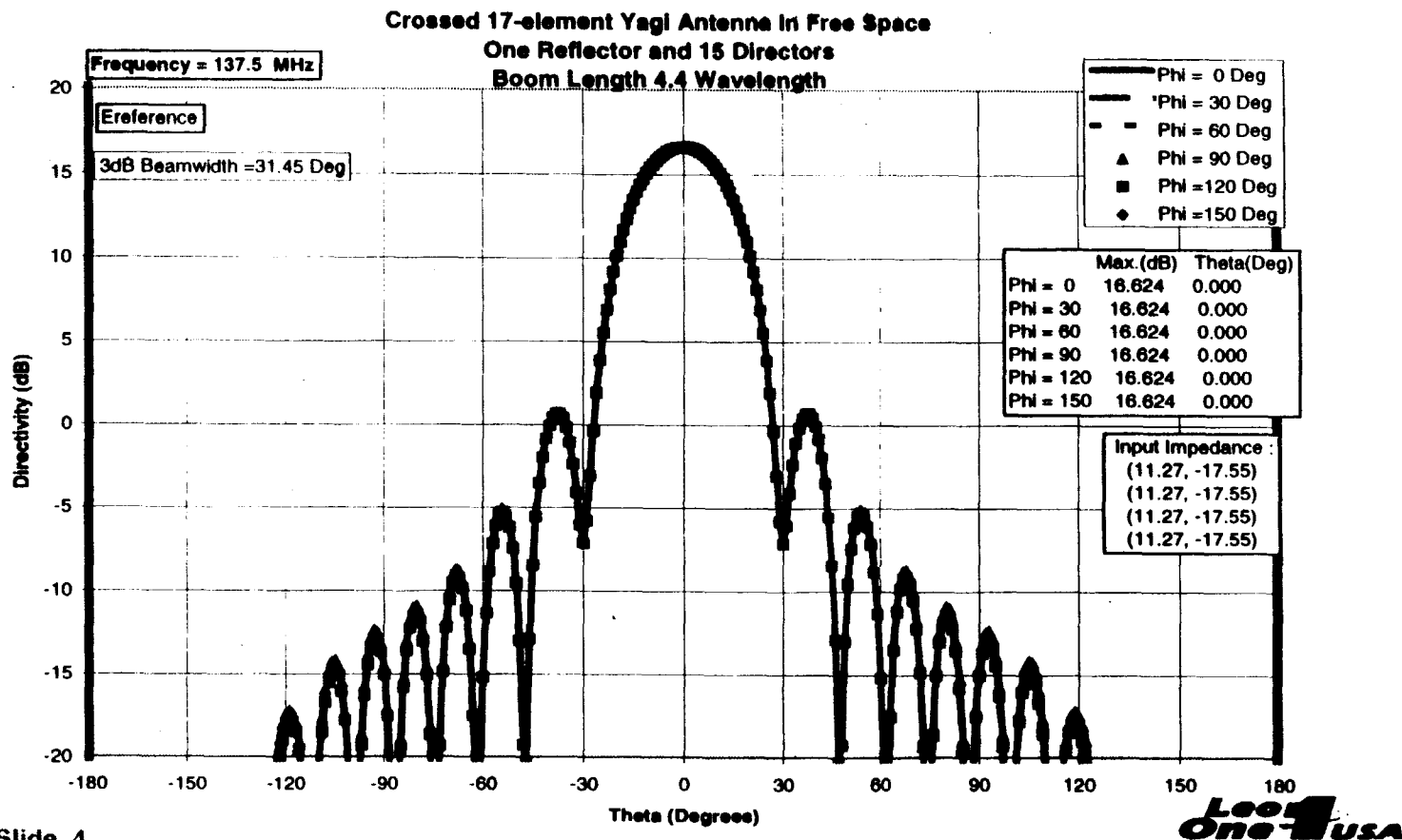
## ***Approach***

- **Calculation of Satellite Constellation Interference Geometry Statistics**
  - ▲ Starsys CDA Mainbeam
  - ▲ Starsys CDA Sidelobes
  - ▲ Conditional Probabilities Computed For Each Applicants Constellation While Starsys CDA tracking a Starsys Satellite
- **Calculation of Interference Environment To Starsys CDA Downlink**
  - ▲ Starsys CDA Mainbeam Interference
  - ▲ Starsys CDA Sidelobes Interference
  - ▲ Starsys CDA Mainbeam & Sidelobes Interference
- **Calculation Of Expected Value Of Starsys CDA Downlink Degradation**
  - ▲ Combined Interference
  - ▲ Sidelobe Only Interference
- **Composite Interference With All Constellations**
- ***Calculations Performed Are Not Worst Case***
  - ▲ But Are From Prospective Of Disadvantaged Starsys User At 10° Elevation With 5° CDA

## CDA Antenna Interference Geometry

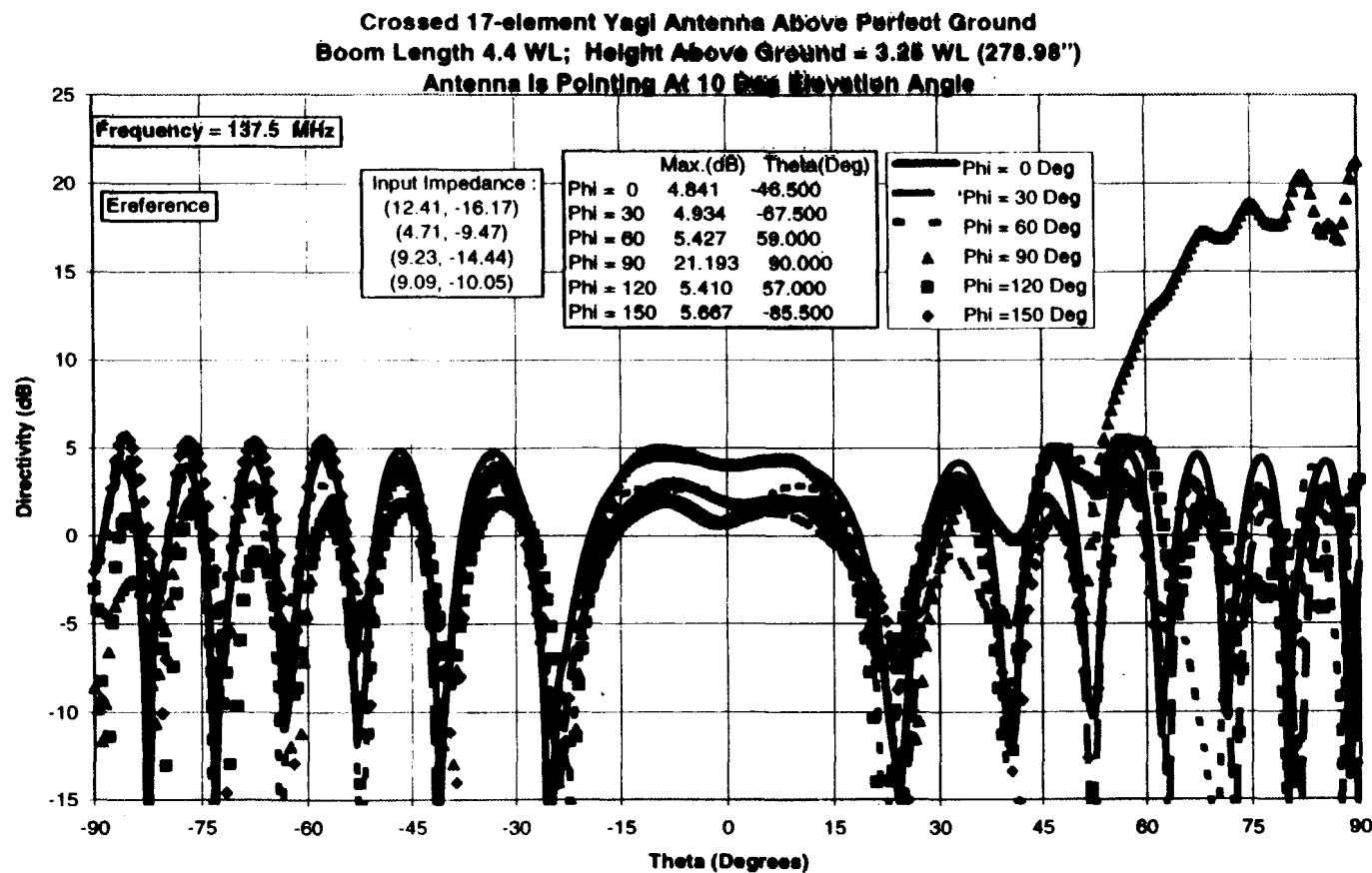
### ■ Mainbeam Interference Computed For Satellites Within 3-dB Beamwidth of 25 Degrees

- ▲ Starsys CDA VHF Yagi Type Antenna (Amended Filing 4/25/94, p A-14)
- ▲ 16 dBi Gain
- ▲ -10 dB Width is Approximately 48°



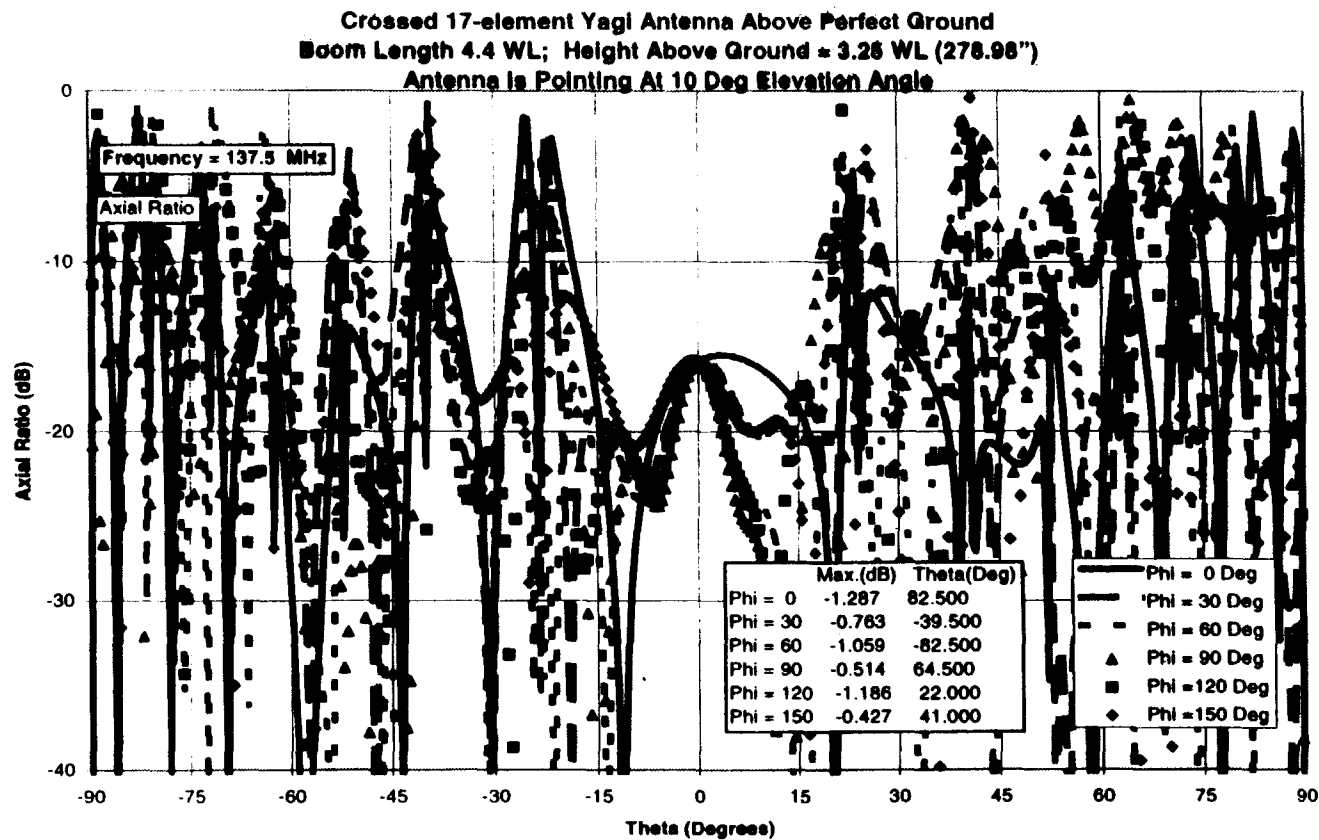
## CDA Antenna Interference Geometry

- Terrain Severely Impacts Yagi Type Antenna Patterns
- 10° Elevation Angle Results In High (-15 dB) Sidelobes And Poor Axial Ratio

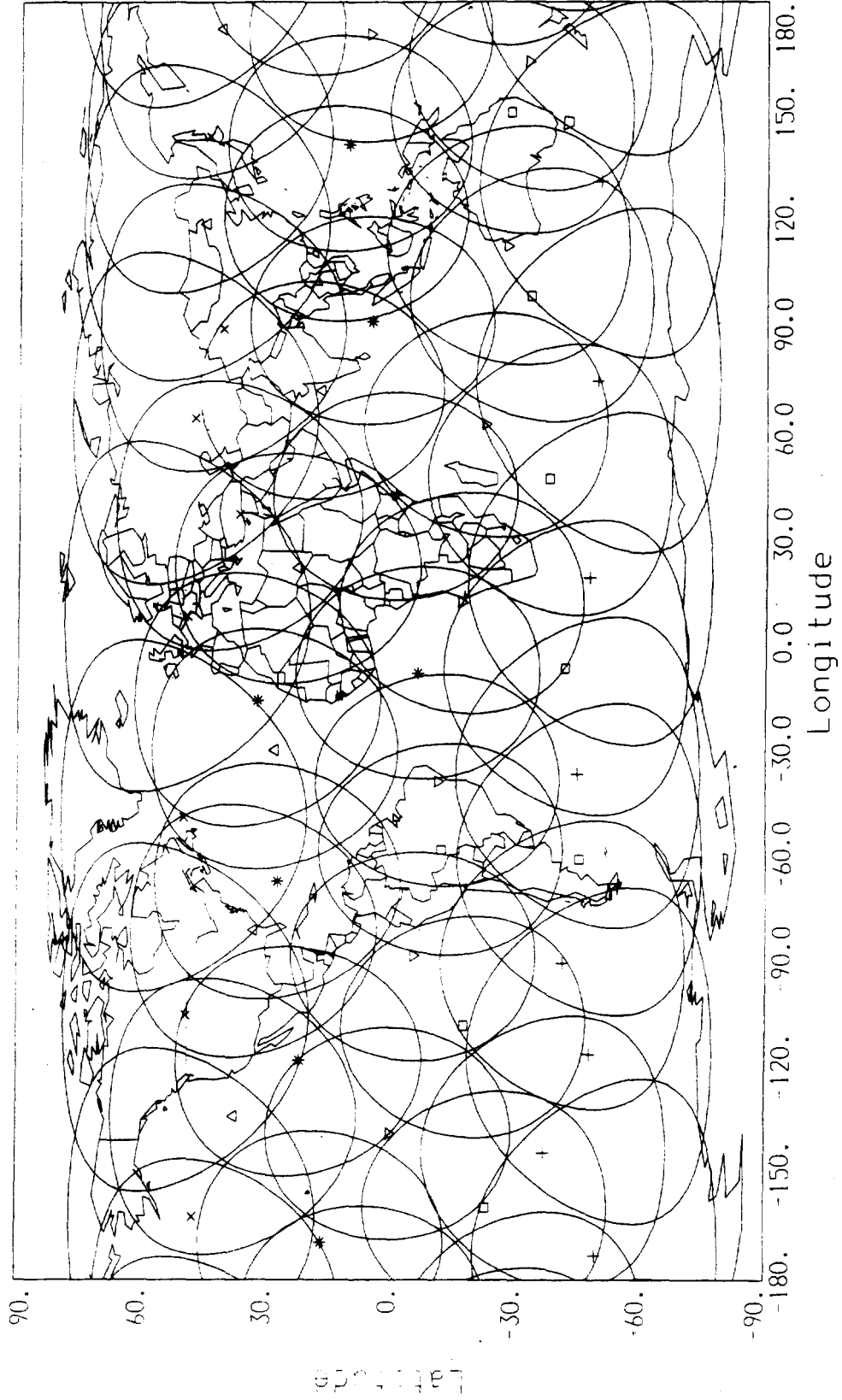


## Sidelobe Interference Polarization Coupling

- Axial Ratio < 4 dB for satellite
- Axial Ratio < 2 dB Over CDA Mainbeam At high elevation angles
  - ▲ Approaches linear polarization in mainbeam near horizon



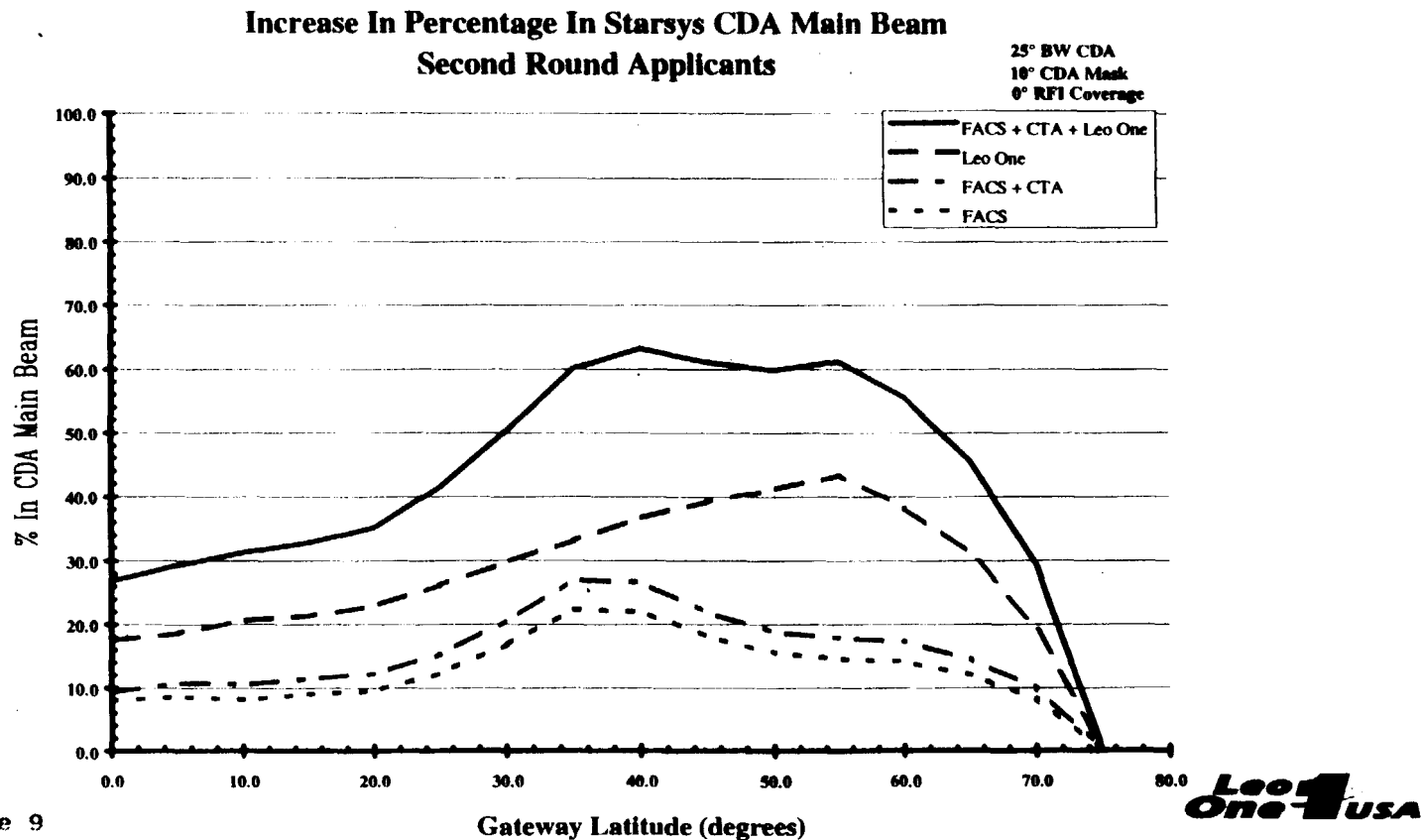
# LEO One 0° Contour Coverage





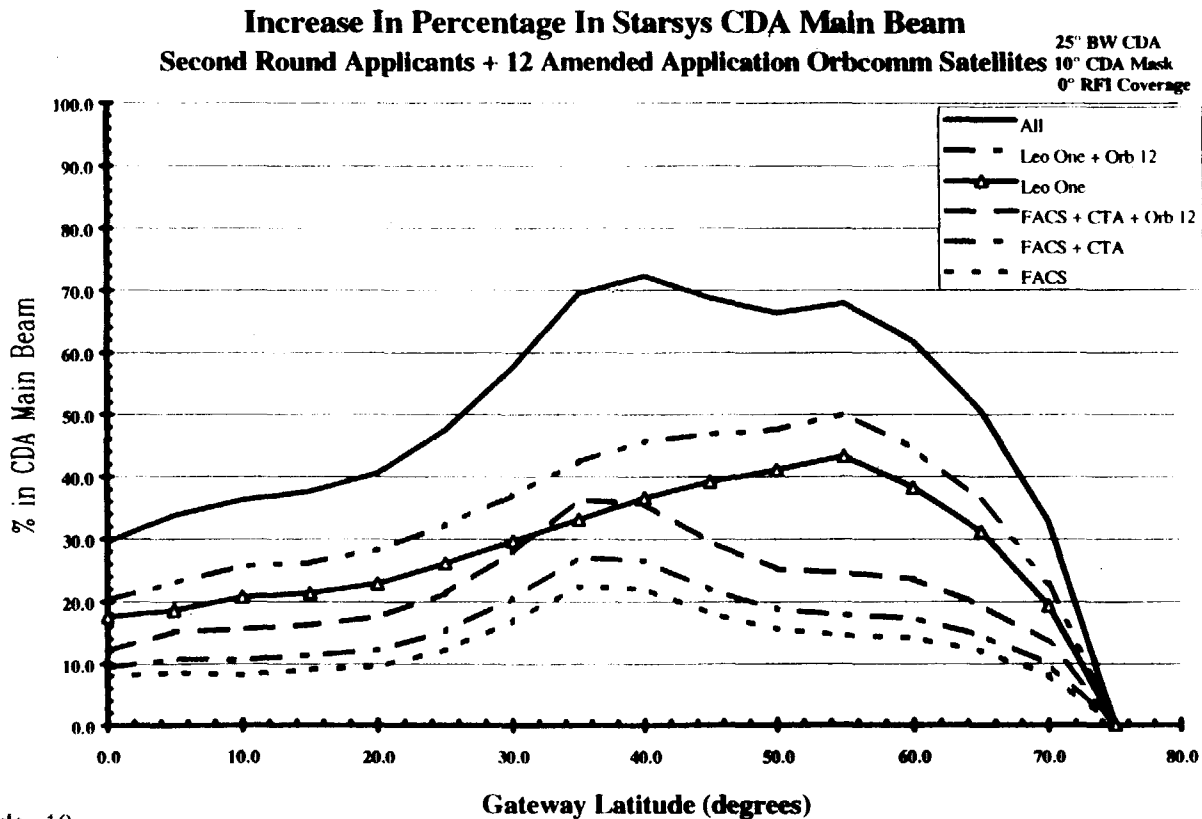
## ***Increase in Percent Of Time At Least One Satellite In Starsys CDA Mainbeam***

- At 40° N. Latitude Sharing With All Entrants Results In Interference 82% of Time
  - ▲ An Increase Of 64%
- FACS & CTA Is least Impact Addition
  - ▲ An Increase of 27% (above existing 23%)



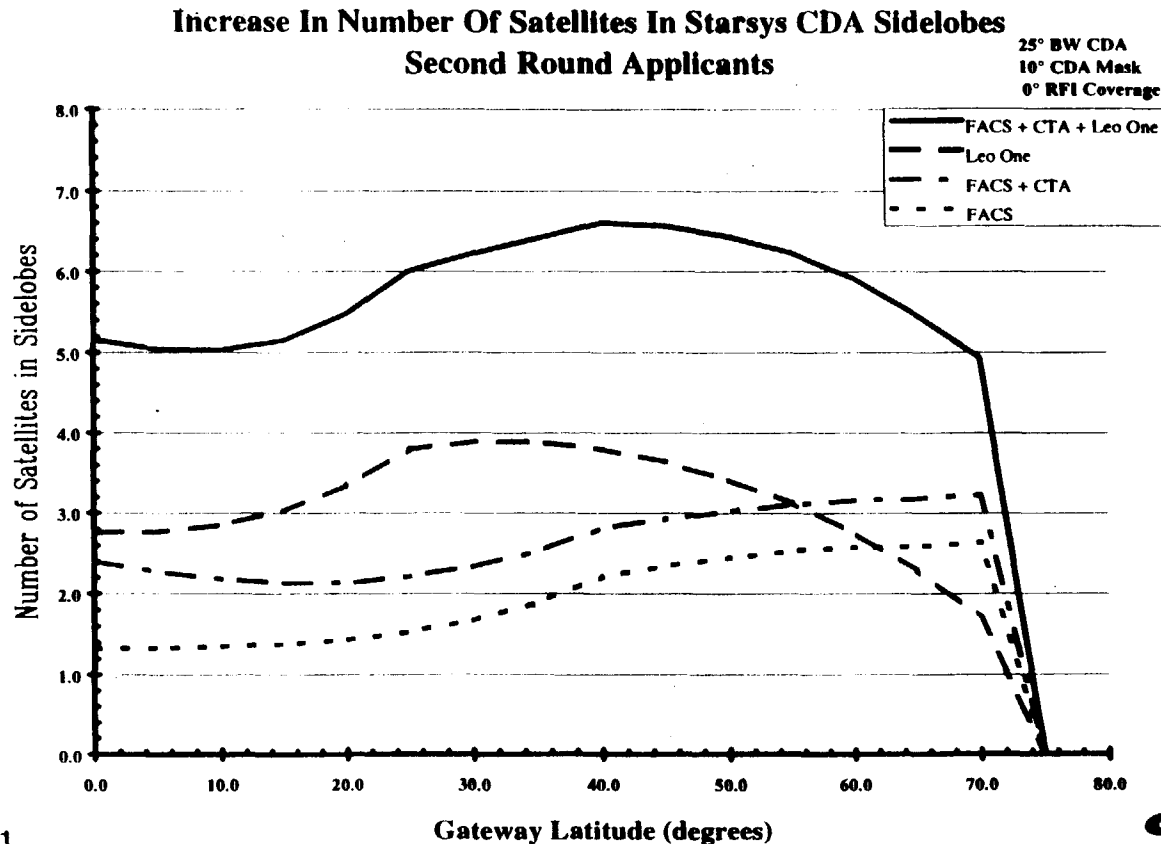
## ***Increase in Percent Of Time At Least One Satellite In Starsys CDA Mainbeam With 12 Satellite Orbcomm Delta***

- At 40° N Latitude Sharing With All Entrants Results In Interference 95.5% of Time
  - ▲ An Increase of 72%
- FACS & CTA Is least Impact Addition
  - ▲ An Increase of 36% (above existing 23%)



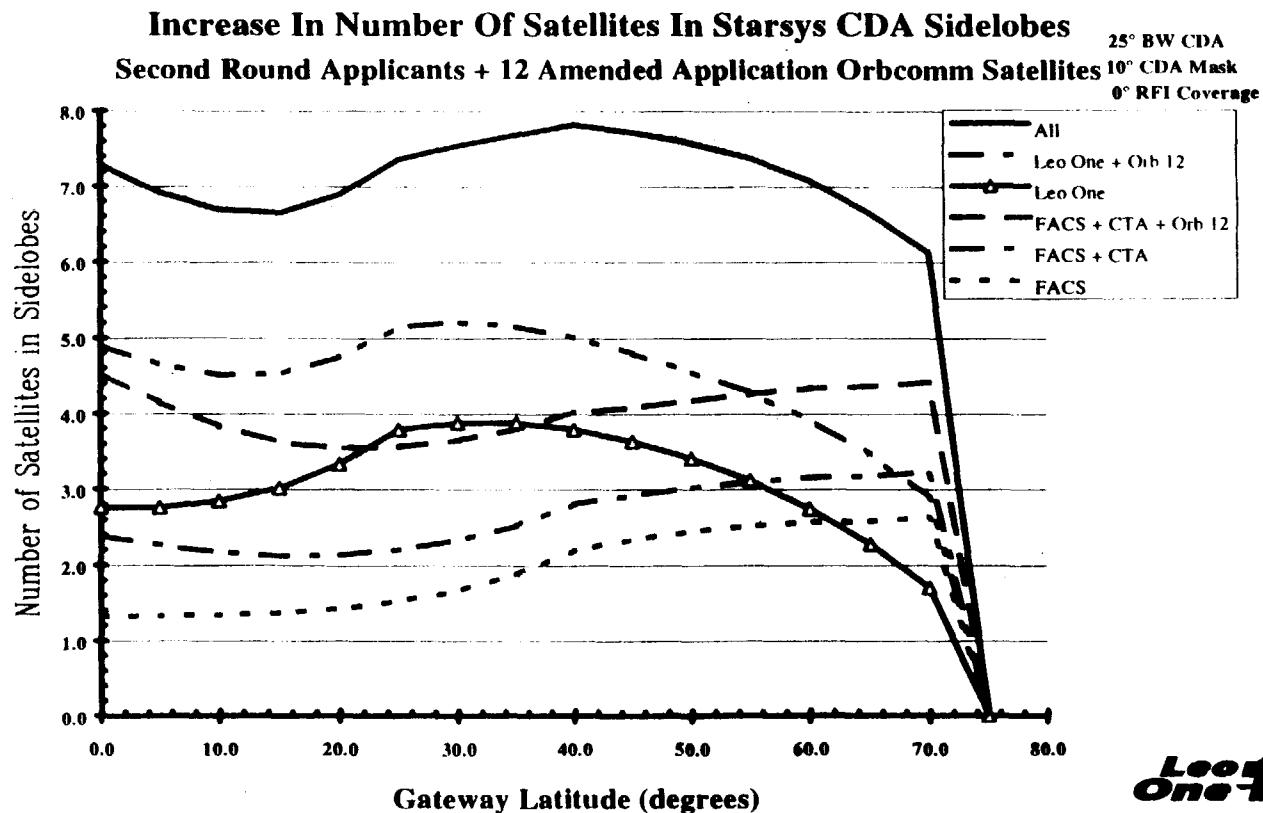
## Increase in Number of Satellites in Sidelobes Of Starsys CDA Antenna

- Sidelobe Interference With All Entrants Is Average Of 9 Satellites At 40° N
  - ▲ An increase of 6.6 satellites with all second round applicants
- FACS & CTA Is Least Impact Addition
  - ▲ 2.8 additional satellites in sidelobes (5.2 satellites total)



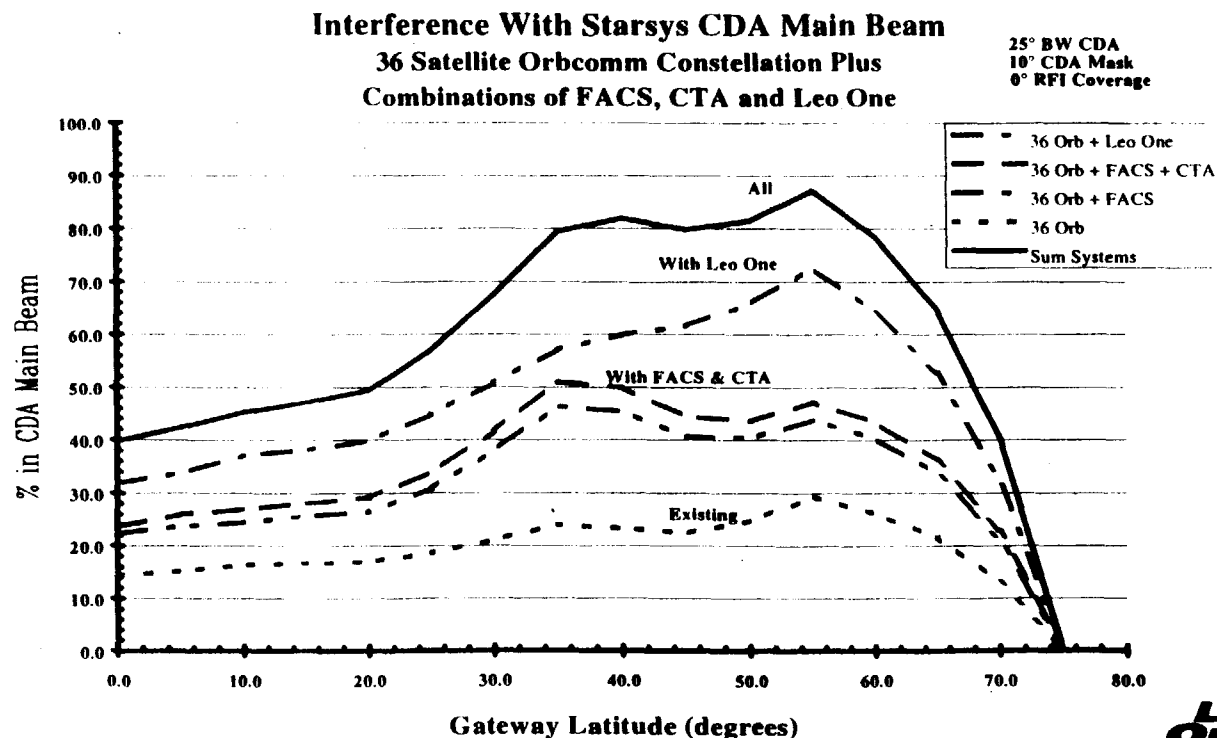
## Increase in Number of Satellites in Sidelobes Of Starsys CDA Antenna With 12 Satellite Orbcomm Delta.

- Sidelobe Interference With All Entrants Is Average Of 10.2 Satellites At 40° N
  - ▲ An increase of 7.8 satellites with all applicants
- FACS & CTA Is Least Impact Addition
  - ▲ 4 additional satellites in sidelobes (6.4 satellites total)



## Percent Of Time At Least One Satellite In Starsys CDA Gateway Mainbeam - Band Sharing With Existing Orbcomm Constellation

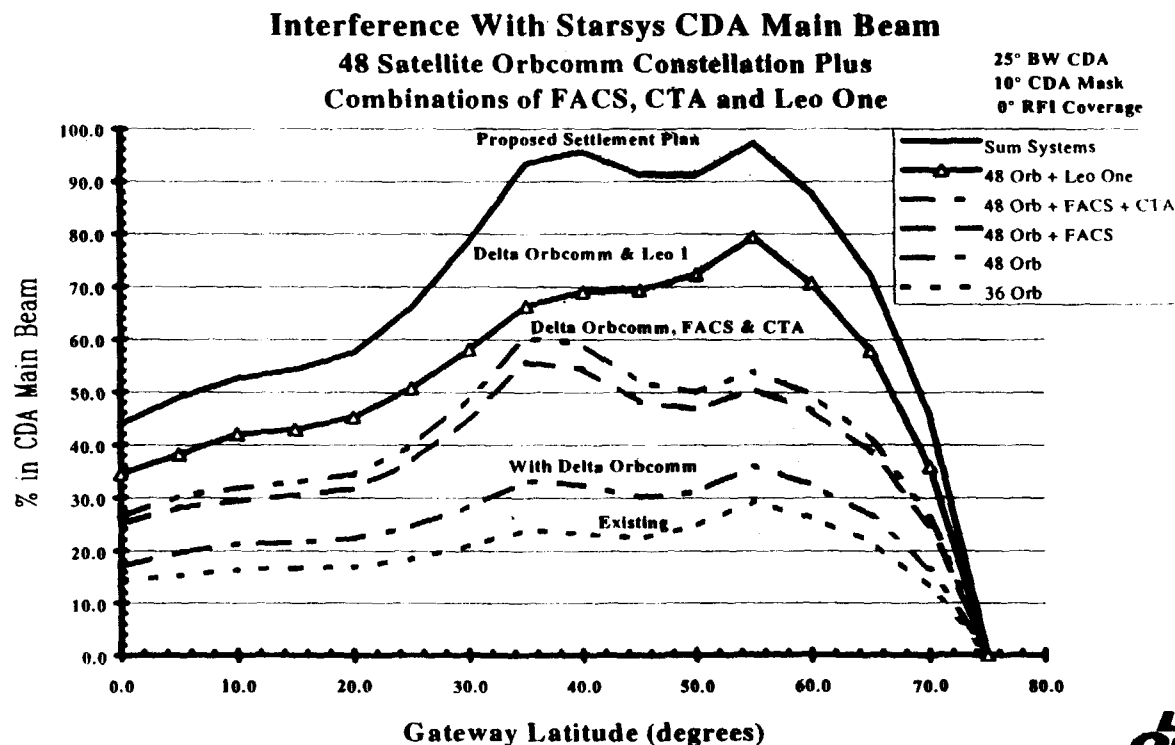
- At 40° N. Latitude Sharing With All Entrants Results in Interference 82% of Time
  - ▲ Starsys may require satellites to turn off downlinks
    - Large imposition on Near Real Time System Availability
- FACS & CTA Is least Impact Addition
  - ▲ Mainbeam interference 50% of time (An increase from 23%)



## Percent Of Time At Least One Satellite In Starsys CDA Gateway Mainbeam

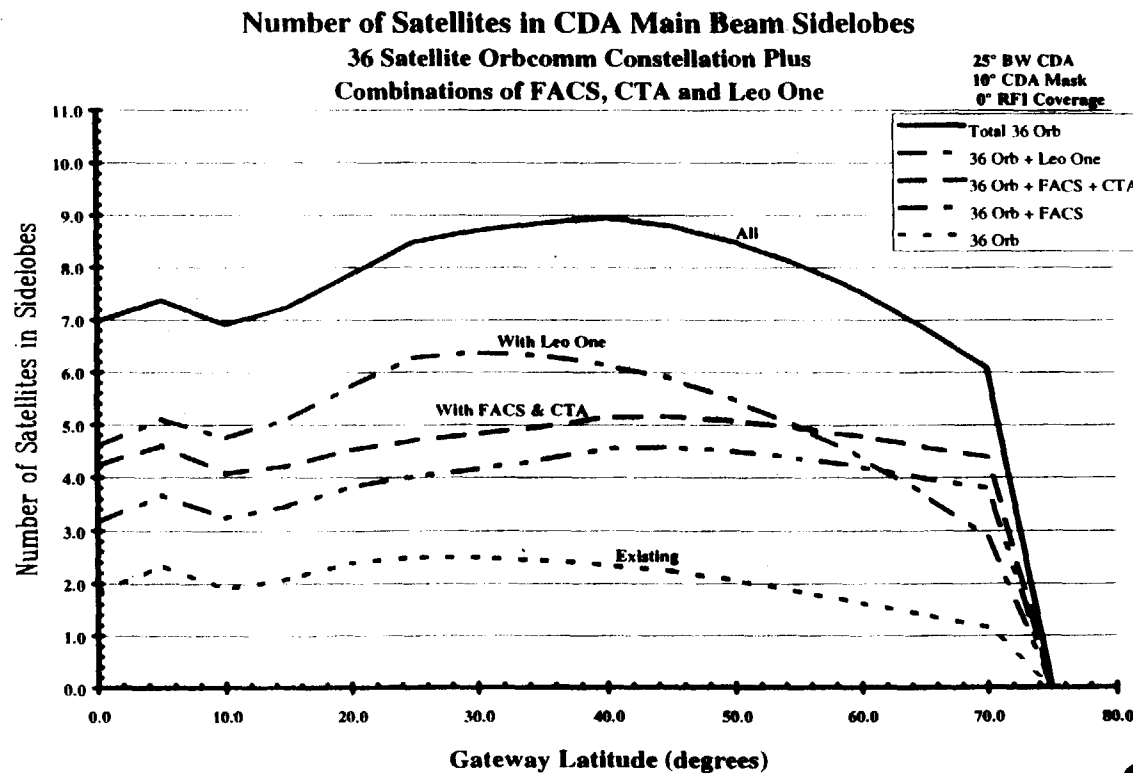
### - Band Sharing With Expanded Orbcomm Constellation

- At 40° N. Latitude Sharing With All Entrants Results in Interference 95.5% of Time
  - ▲ Starsys may require satellites to turn off downlinks
    - Large imposition on Near Real Time System Availability
- FACS & CTA Is least Impact Addition
  - ▲ Mainbeam interference 58% of time With Delta Orbcomm



# **Number of Satellites in Sidelobes Of Starsys CDA Gateway Antenna** **- Band Sharing With Existing Orbcomm Constellation**

- Sidelobe Interference With All Entrants is Average Of 9 Satellites
  - ▲ At 40° N Latitude
- FACS & CTA Is least Impact Addition
  - ▲ 2.8 additional satellites in sidelobes (5.2 satellites total)

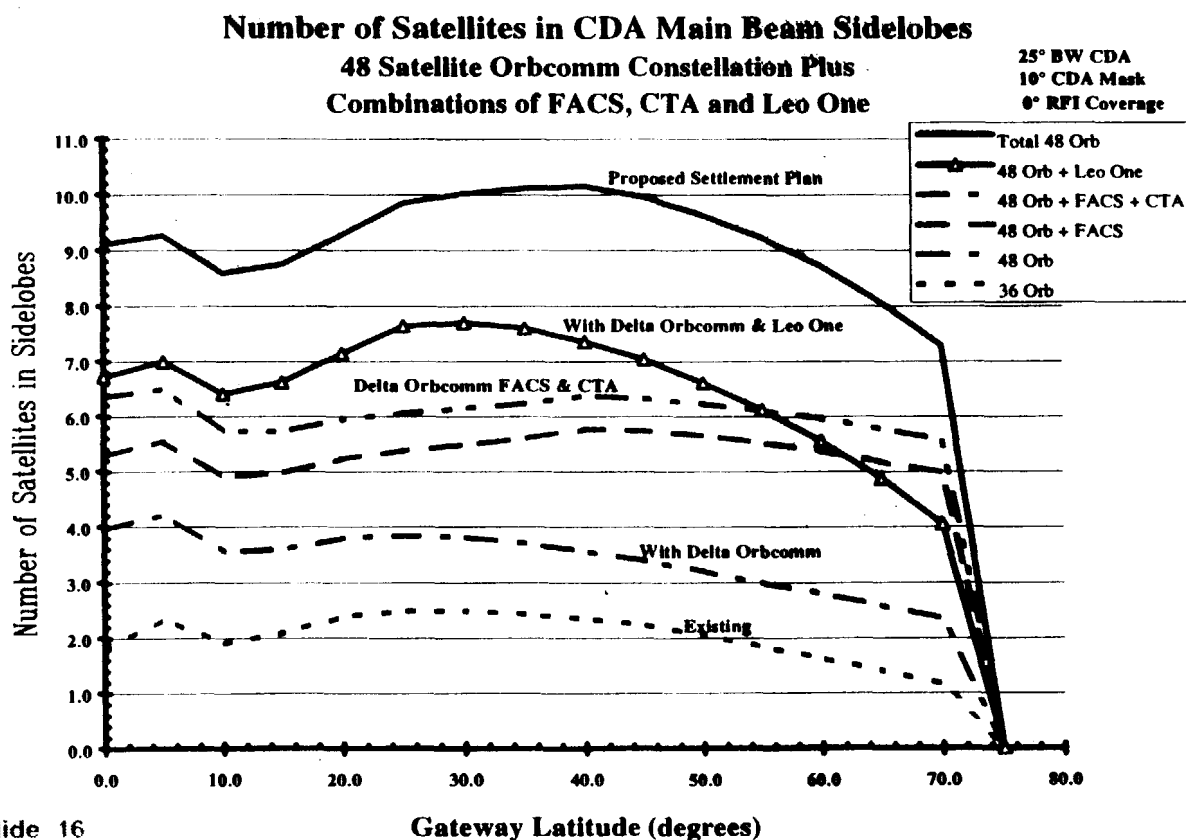


**Leo One USA**

# Number of Satellites in Sidelobes Of Starsys CDA Gateway Antenna

## - Band Sharing With Expanded Orbcomm Constellation

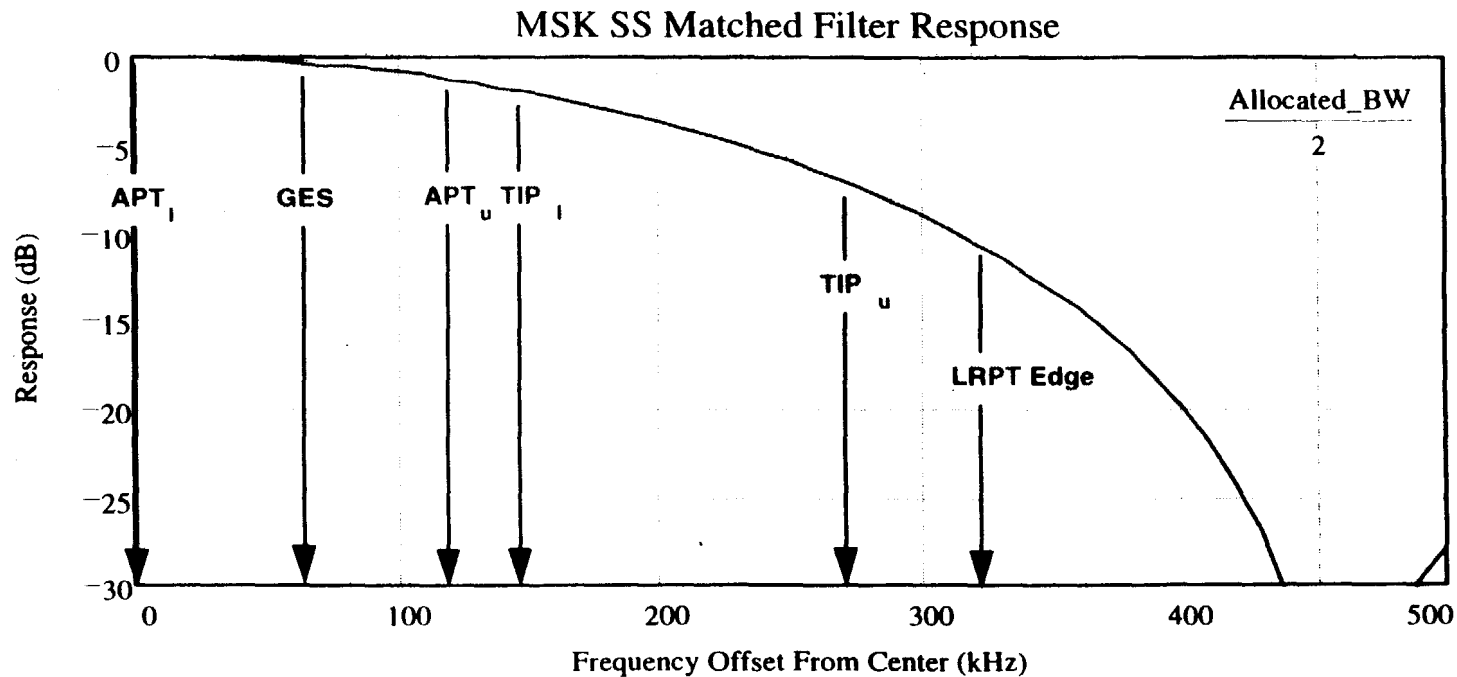
- Sidelobe Interference With All Entrants is Average Of 10.2 Satellites
  - ▲ At 40° N Latitude
- FACS & CTA Is least Impact Addition with Delta Orbcomm
  - ▲ 4 additional satellites in sidelobes (6.4 total)





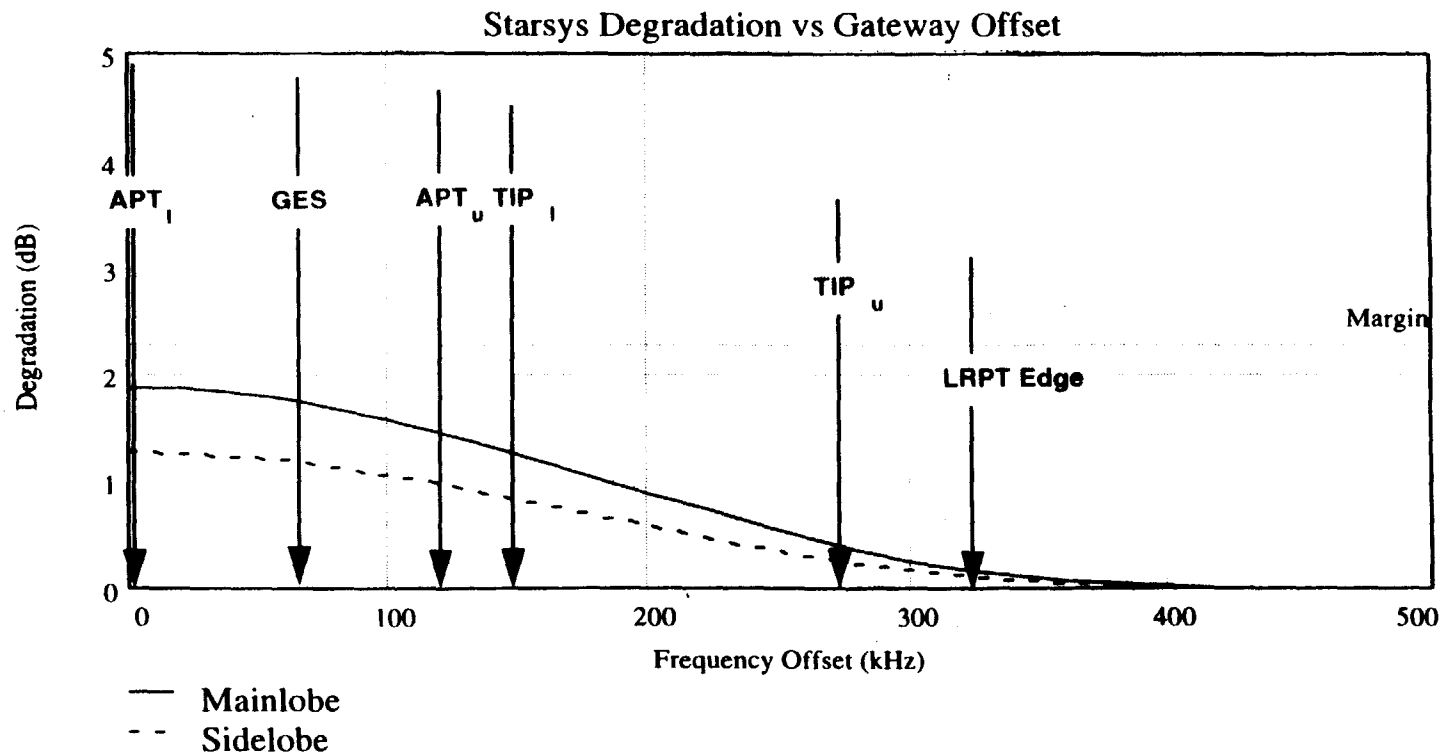
## STARSYS CDMA Matched Filter Response Versus Band Allocations

- Starsys Must Accept Additional Degradation From New Entrants
  - ▲ Center APT Channel Response Is The Same As Orbcomm GES And Should Be No Different To Starsys
  - ▲ Upper & Lower APT and Lower TIP channel responses are all similar



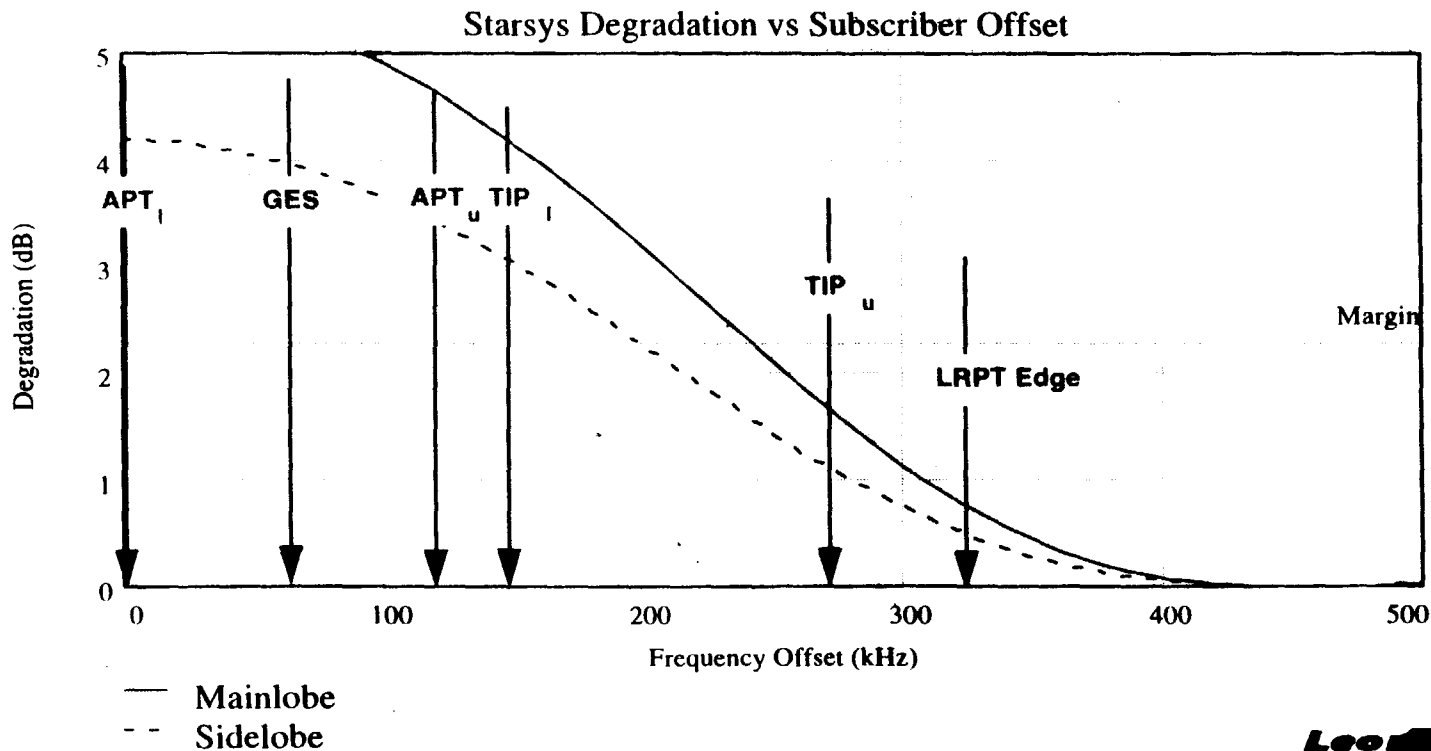
## Starsys Degradation Versus Band Allocations For Gateways

- Calculation Per ITU Document 8D/TEMP/72(Rev.1)-E, 7 Nov. 1996
  - ▲ As Recommended By Starsys In NPRM Comments
  - ▲ Gateway Links At PFD Limit Equivalent To Orbcomm (6.5 dBW EIRP)



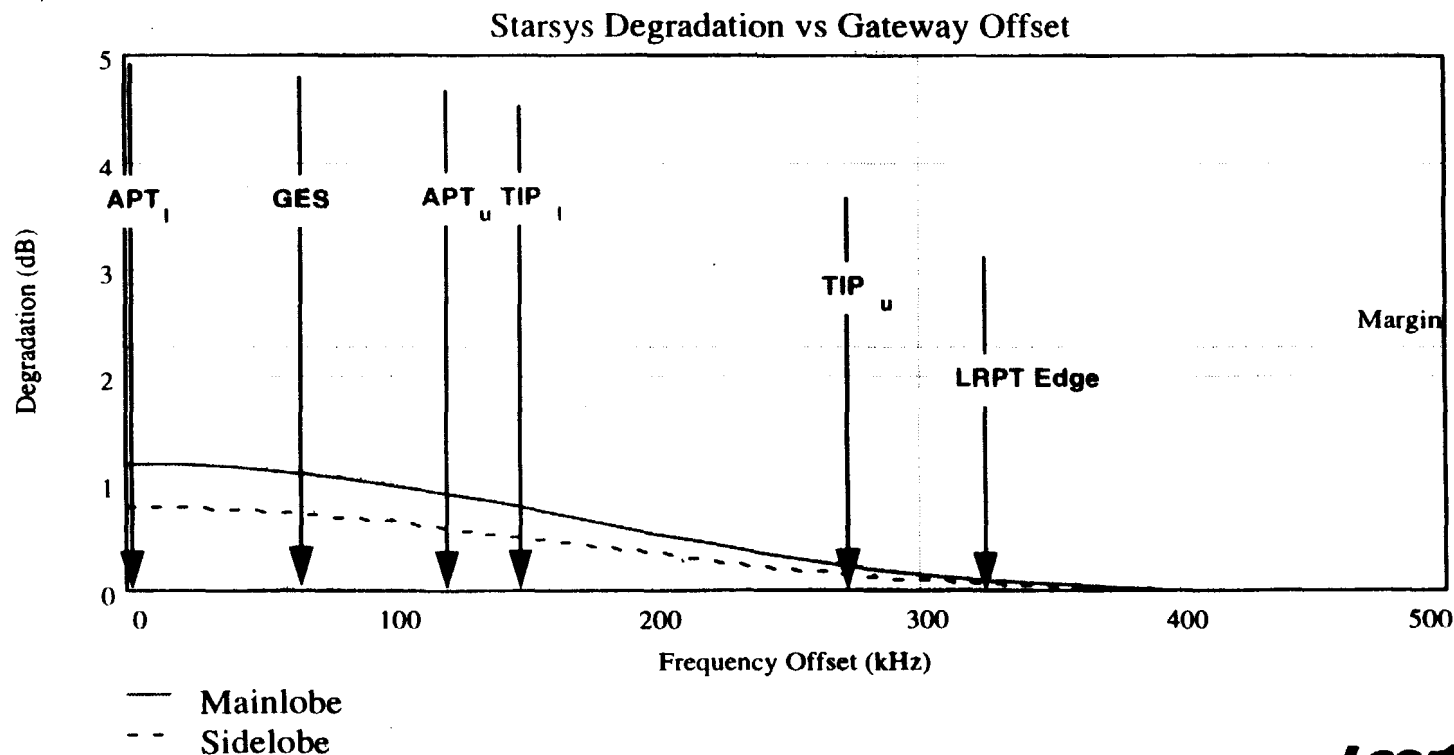
## Starsys Degradation Versus Band Allocations For Subscriber Links At Max PFD

- Calculation Per ITU Document 8D/TEMP/72(Rev.1)-E, 7 Nov. 1996
  - ▲ As Recommended By Starsys In NPRM Comments
  - ▲ Subscriber Links At Max PFD Limit of -125 dB(W/m<sup>2</sup>/4-kHz)
  - ▲ Subscriber Links Fit Best In LRPT Subbands



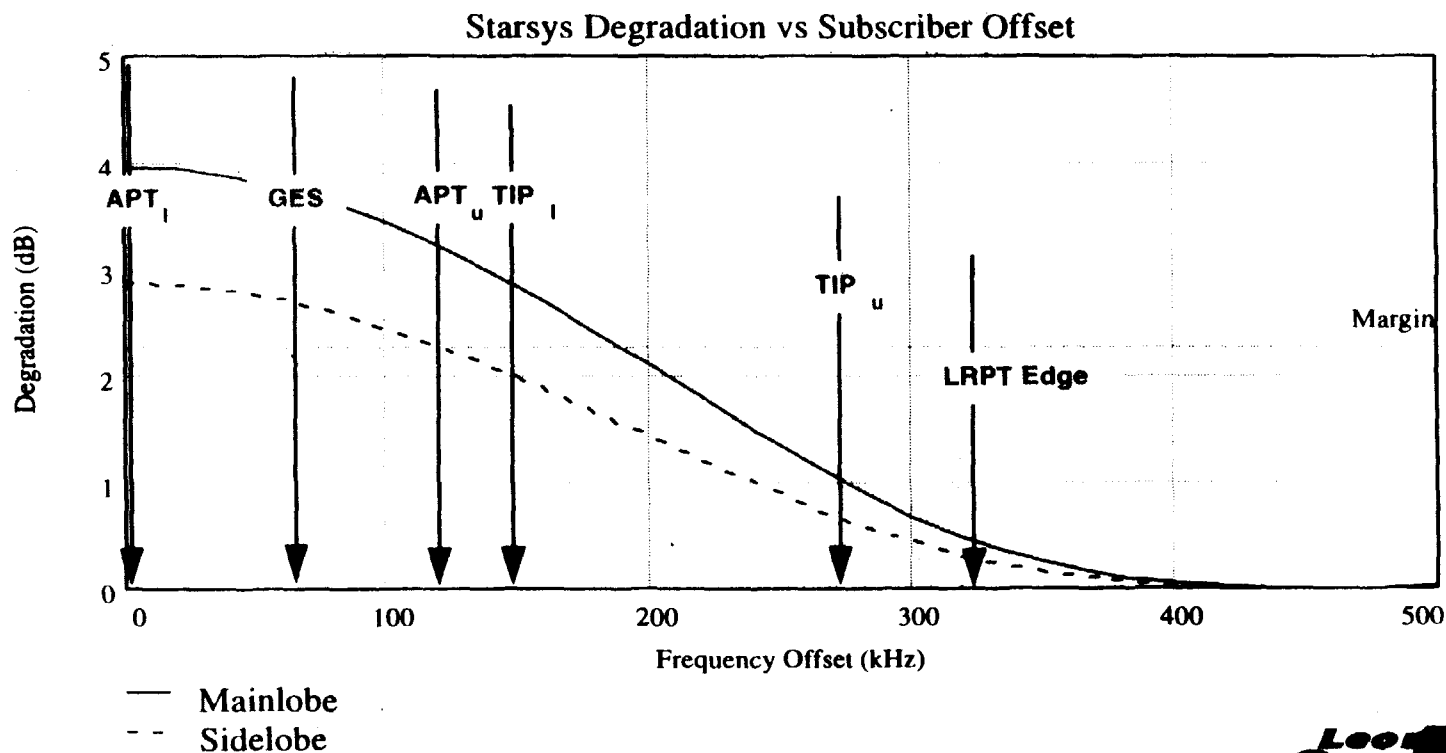
## Starsys Degradation With 3 dB Downlink Power Increase Versus Band Allocations For Gateways

- Calculation Per ITU Document 8D/TEMP/72(Rev.1)-E, 7 Nov. 1996
  - ▲ As Recommended By Starsys In NPRM Comments
- Max Mainbeam Interference Reduced 0.7 dB
- Max Sidelobe Interference Reduced 0.5 dB



## Starsys Degradation With 3 dB Downlink Power Increase Versus Band Allocations For Subscriber Links At Max PFD

- Calculation Per ITU Document 8D/TEMP/72(Rev.1)-E, 7 Nov. 1996
  - ▲ Subscriber Links At Max PFD Limit of -125 dB(W/m<sup>2</sup>/4-kHz)
- Max Mainbeam Interference Reduced 1.6 dB
- Max Sidelobe Interference Reduced 1.3 dB



## ***Link Degradation Analysis Performed***

- **As Per ITU Document 8D/TEMP/72(Rev.1)-E, 7 Nov. 1996**
  - ▲ Recommended by Starsys in NPRM Reply Comments (p.20)
- **Degradation computed relative to 2.4 dB margin degradation due to Orbcomm Interference Floor**
- **Gateways uniformly spread across APT, TIP and LRPT bands**
  - ▲ All identical to Orbcomm Gateway With 6.5 dBW EIRP
  - ▲ (Also recomputed per Plan X/Y allocations)
- **Optimized for Subscribers located in LRPT bands**
  - ▲ All at -125 dB(W/m<sup>2</sup>/4-kHz)
- **Starsys calculation for most disadvantaged user per ITU Document**
  - ▲ 5° EI on CDA downlink
  - ▲ 10° EI on User uplink
  - ▲ 11 other CDMA uplink users at 25° mean elevation angle
- **Polarization discrimination included**
  - ▲ 13 dB in mainbeam of CDA
  - ▲ 8 dB in sidelobes of CDA plus sidelobe gain -15 dB relative to mainbeam

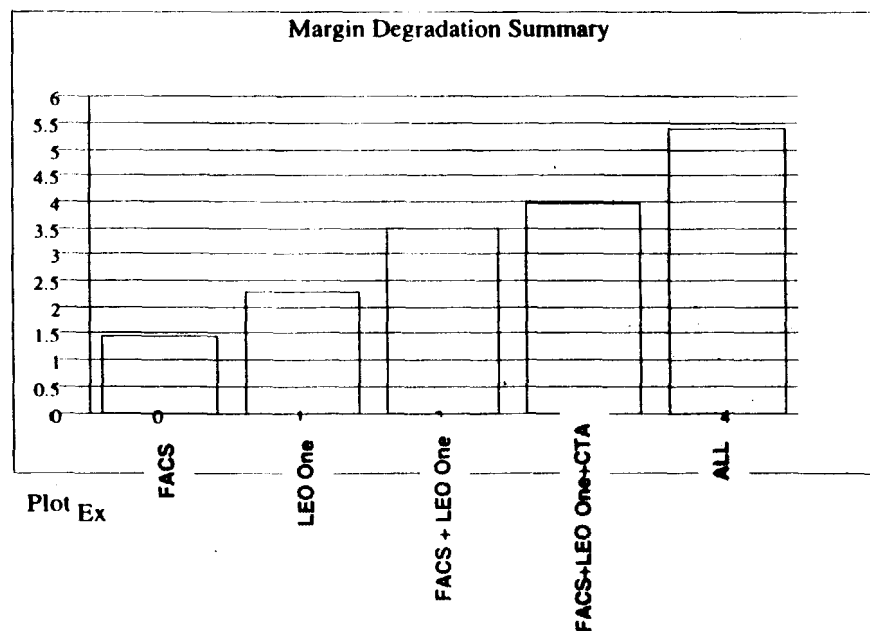
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## ***Link Degradation Analysis Performed - Continued***

- **Degradation computed for average number of satellites in Mainbeam combined with number in Sidelobes**
  - ▲ One gateway and one subscriber link per satellite
  - ▲ For 40° N Latitude
  - ▲ 48-LEO One has 1.2 sats in mainbeam (for percent of time) and 3.8 average in sidelobes
  - ▲ 26-FACS has 1.1 sats in mainbeam and 2.2 in sidelobes
  - ▲ 36-Orbcomm has 1.2 sats in mainbeam and 2.3 in sidelobes
  - ▲ 12-Orbcomm has 1.0 sats in mainbeam and 1.2 in sidelobes
  - ▲ 12-CTA has 1.0 sats in mainbeam and 1.2 in sidelobes
  - ▲ 6-ESAT has 1.0 sats in mainbeam and 1.0 in sidelobes
- **Expected degradation computed for percentage of Time in CDA mainbeam and sidelobes as shown earlier**
  - ▲ For Satellites in Mainbeam and Sidelobe
  - ▲ For Satellites only in Sidelobe
  - ▲ For Satellites only in Mainbeam

## Starsys Link Margin Degradation For 137 MHz

- Analysis Shows FACS Decreases Margin By 1.4 dB
- Leo One Decreases Margin By 2.3 dB
  - ▲ 0.9 dB more than FACS
- FACS And LEO One Combined As Per Settlement Plan Decreases Margin By 3.5 dB
- The addition of Delta Orbcomm, FACS, CTA and LEO One Decreases Margin By 5.4 dB
  - ▲ Settlement plan approach





## ***Starsys Link Margin Degradation For 137 MHz - Gateways Only***

- Analysis Shows FACS Decreases Margin By 0.9 dB
- Leo One Decreases Margin By 1.4 dB
  - ▲ 0.5 dB more than FACS
- FACS And LEO One Combined As Per Settlement Plan Decreases Margin By 2.3 dB
- The addition of Delta Orbcomm, FACS, CTA and LEO One Decreases Margin By 3.8 dB
  - ▲ Settlement plan approach

